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10/659,425	09/11/2003	Manabu Nohara	4105-24	4088

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EXAMINER	
LIU, LI	

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2613	

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Please find below and/or attached an Office communication concerning this application or proceeding.

The time period for reply, if any, is set in the attached communication.

Office Action Summary	Application No. 10/659,425	Applicant(s) NOHARA ET AL.	
	Examiner Li Liu	Art Unit 2613	

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) OR THIRTY (30) DAYS, WHICHEVER IS LONGER, FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

1)☒ Responsive to communication(s) filed on *17 April 2007*.

2a)☒ This action is **FINAL**. 2b)☐ This action is non-final.

3)☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

4)☒ Claim(s) *2,5 and 7* is/are pending in the application.

4a) Of the above claim(s) _____ is/are withdrawn from consideration.

5)☐ Claim(s) _____ is/are allowed.

6)☒ Claim(s) *2,5 and 7* is/are rejected.

7)☐ Claim(s) _____ is/are objected to.

8)☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

9)☐ The specification is objected to by the Examiner.

10)☒ The drawing(s) filed on *17 April 2007* is/are: a)☒ accepted or b)☐ objected to by the Examiner.

Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).

Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).

11)☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

Priority under 35 U.S.C. § 119

12)☒ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).

a)☒ All b)☐ Some * c)☐ None of:

1.☒ Certified copies of the priority documents have been received.

2.☐ Certified copies of the priority documents have been received in Application No. _____.

3.☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

* See the attached detailed Office action for a list of the certified copies not received.

Attachment(s)

1) ☒ Notice of References Cited (PTO-892)
2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)
3) ☐ Information Disclosure Statement(s) (PTO/SB/08) Paper No(s)/Mail Date _____.
4) ☐ Interview Summary (PTO-413) Paper No(s)/Mail Date. _____.
5) ☐ Notice of Informal Patent Application
6) ☐ Other: _____.

DETAILED ACTION

Response to Arguments

1. Applicant's arguments files on April 17, 2007 with respect to claim 2, 5 and 7 have been fully considered but they are not persuasive. The examiner has thoroughly reviewed Applicant's amendment and arguments but firmly believes that the cited reference reasonably and properly meet the claimed limitation as rejected.

Applicant's argument – "The applied references, taken alone or in combination, are at least deficient with respect to choosing a carrier frequency in according with this equation. ... . Helkey et al does not disclose or suggest the use of a Nyquist filter, and thus an equation involving a **rolloff factor** would not have been applied in the Helkey et al arrangement."

Examiner's response – As disclosed by the applicant, the formula $fc>3(1+\alpha)fsr/2$ is used to determine the carrier frequency fc so that the **secondary distortion** does not take place because the **cross modulated wave** does not enter the use frequency band even though the optical device having non-linearity is utilized. Therefore, the data communication in a multi-value modulating system, in which the information can be also carried by the amplitude, is possible with the optical device having non-linearity.

Helkey et al discloses that most modulators exhibit the nonlinear response. The nonlinearities can appear in the output of the optical sampler as higher order noise. What is needed is an optical sampler/electrical quantizer configuration in which second-order modulator distortion products can be rejected.

Helkey et al provides a system and method in which the sampler frequency is chosen such that **second-order distortion** products generated in the sampler are separated in frequency from the sampled input band. "In general, in order to keep the second order intermodulation distortion bands outside of the sampled input band the following must be true: 2*f1 > f2 (equation (5), or according to the applicant's definition/convention: 2*fd > fu). Values for f1 (or fd) and f2 (or fu) which do not satisfy Eq. (5) will violate the Nyquist criteria (column 6, line 10-39).

That is, both Helkey et al and the applicant try to solve the same problem - nonlinear effects such as high order intermodulation distortions - by the same stratege: use a frequency critreria to choose the carrier frequency.

Helkey et al discloses a general equation: 2*f1 > f2 (Eq. (5), or 2*fd>fu in applicant's convention). For a square filter, the frequency condition can be written as fc>3*fsr, where the fsr = fu-fd or the sampled input bandwidth or symbol rate, and fc is the carrier frequency or fc = fd+(fu-fd)/2.

Although Helkey et al does not expressly dicloses a Nyquist filter, such limitation are merely a matter of design choice and would have been obvious in the system of Helkey et al.

It is well known that an exact square filter is not in existence, and **various filter designs and orders of filters have different drop-off rates or roll-off factors**. No matter what kind of filter is used, the frequency condition 2*f1 > f2 (Eq. (5), or 2*fd>fu) must be satisfied in order to reject the second order intermodulation distortion.

The limitations in claims 2, 5 and 7 do not define a patentably distinct invention over that in Helkey et al since both the invention as a whole and Helkey et al are directed to to reject the second order intermodulation distortion. To use a Gauss filter, or Super Guass filter, or Nyquist filter is inconsequential for the invention as a whole and presents no new or unexpected results, so long as the frequency conditions are satisfied and higher order intermodulation distortion is rejected.

The Nyquist filter or the formula $fc>3(1+\alpha)fsr/2$ is just one of the special cases of the Helkey's Eq. (5): 2*f1 > f2 (or 2*fd>fu).

One of cited priors in the conclusion, Nguyen et al (US 6,509,796), also teaches a Nyquist filter to reject the nonlinear effects, and the "rule of thumb in choosing intermediate frequencies is to choose the first intermediate frequency at twice the highest input frequency anticipated. This is to reduce the possibility of spurious second order intermodulation distortion".

The Nyquist filter has been widely used in digital or optical communications, such Nyquist filter has the advantage to eliminate the inter-symbol interference et at and minimize the noise effects (McCarty: BACKGROUND). Therefore, it would have been obvious to one of ordinary skill in the art at the time the invention was made to apply the Nyquist filter to the system of Helkey et al so that the noise effect can be efficiently minimized and nonlinear distortion can be removed. When a Nyquist filter is used, the formula $fc>3(1+\alpha)fsr/2$ is an inherent result from Helkey's Eq. (5) due to the roll-off factor α of the Nyquist filter.

Claim Rejections - 35 USC § 101

2. 35 U.S.C. 101 reads as follows:

> Whoever invents or discovers any new and useful process, machine, manufacture, or composition of matter, or any new and useful improvement thereof, may obtain a patent therefor, subject to the conditions and requirements of this title.

3. Claim 7 is rejected under 35 U.S.C. 101 because the claimed invention is directed to non-statutory subject matter.

Claim 7 claims a computer program per se. A computer program must be claimed encoded on a computer readable medium to be able to realize its function. Without the computer readable medium, the claim 7 is non-statutory. Examples of acceptable language in computer-processing related claims are: a computer readable medium embodied with a computer program; or a computer readable medium encoded with a computer program.

Claim Rejections - 35 USC § 103

4. The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

> (a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negatived by the manner in which the invention was made.

5. Claims 2 and 5 are rejected under 35 U.S.C. 103(a) as being unpatentable over Helkey et al (US 6,469,649) in view of in view of Sakura et al (US 2001/0043093) and McCarty (US 6,628,728).

Helkey et al discloses a modulating apparatus for optical communication which modulates a carrier by a modulation signal and generates a modulated wave, wherein modulation is executed to satisfy (column 6, line 10-26):

fd>f1, (the f_1 of Helkey et al is the fd of the applicant, and the lower limit frequency of a use-permitted frequency band can be any number between the "2" and "5" in Figure 8).

fu<f2, (the f_2 of Helkey et al is the fu of the applicant, and the upper limit frequency of a use-permitted frequency band can be any number between the "7" and "10" in Figure 8) and

fd>fu/2 (Eq. 5, $f_1>f_2/2$, column 6, line 26, and column 27-39),

Helkey discloses a center frequency $fc = (f_1+f_2)/2$, and then

$f_1 = fc - (f_1+f_2)/2$, and $f_2 = fc + (f_1+f_2)/2$,

by Eq. 5, $f_1>f_2/2$, it can be easily obtained that:

$fc = (f_1+f_2)/2 > 3*(f_2-f_1)/2$,

For a square filter, the symbol rate fsr can be interpreted as (f_2-f_1), we have: fc > 3fsr/2.

when a lower limit frequency of a use-permitted frequency band is f_1 [Hz], an upper limit frequency of the use-permitted frequency band is f_2 [Hz], a carrier frequency is fc [Hz], and a symbol rate of the modulation signal is fsr.

But, Helkey et al discloses a modulated laser and does not discloses that (A) the modulating apparatus generates a modulated wave to be supplied to a **light emitting diode** or a light transmitting unit having the light emitting device which is driven by the

modulated wave generated by the modulating apparatus and outputs a light-modulated wave; and (B) fc>3(1+ α)fsr/2, a rolloff factor is α.

With regard to item (A), however, Sakura et al teaches a light transmitting unit, LEDs driven by the modulated wave generated by the modulating apparatus and outputs a light-modulated wave, for optical communication because the LEDs can reduce the module cost ([0009]).

Therefore, it would have been obvious to one of ordinary skill in the art at the time the invention was made to combine the LEDs taught by Sakura et al with system and method of Helkey et al so that the system cost can be reduced and the nonlinear distortion can be removed.

With regard to item (B), the Nyquist filter has been widely used in digital or optical communications, such Nyquist filter has the advantage to eliminate the inter-symbol interference et at and minimize the noise effects, as disclosed by McCarty (BACKGROUND).

While the Nyquist filter is used, the parameter controlling the bandwidth of the raised cosine Nyquist filter is the roll-off factor α. The roll-off factor α is one (α =1) if the ideal low pass filter bandwidth is doubled, that is the stop band goes to zero at twice the bandwidth ($2f_N$) of an ideal brick wall filter at f_N. If α.=0.5 a total bandwidth of $1.5f_N$ would result, and so on (Figure 3a, column 4 line 56-65, and column 5 the equations). The lower the value of the roll-off factor α, the more compact the spectrum becomes but the longer time it takes for the impulse response to decay to zero. The most bandwidth efficient filter is the "brick wall" filter illustrated in Fig. 3a by the box (α=0). FIGS. 3a and

3b illustrate three cases, namely when $\alpha=0$, $\alpha=0.5$ and $\alpha=1.0$. Because of the roll-off factor α, the frequency band for a roll-off factor α can be written as $(1+\alpha)f_N$.

Then for a carrier frequency of fc and a symbol rate fsr (that is $2f_N$ in McCarty), it is inherent that: the upper limit sideband for a roll-off factor α will be: $fu = fc + (1+\alpha)f_{sr}/2$; and the lower limit sideband for a roll-off factor α will be: $fd = fc - (1+\alpha)f_{sr}/2$. Therefore, through the Eq. 5, $f_1>f_2/2$ (or fd>fu/2), disclosed by Helkey, it can be easily obtained that:

$fc > 3(1+\alpha)fsr/2$.

The Nyquist filter or the formula $fc>3(1+\alpha)fsr/2$ is just one of the special cases of the Helkey's Eq. (5): 2*f1 > f2 (or 2*fd>fu). Therefore, it would have been obvious to one of ordinary skill in the art at the time the invention was made to apply the Nyquist filter taught by McCarty to the system of Helkey et al so that the noise effect can be efficiently minimized and nonlinear distortion can be removed.

6. Claim 7 is rejected under 35 U.S.C. 103(a) as being unpatentable over Helkey et al (US 6,469,649) in view of in view of Sakura et al (US 2001/0043093) and McCarty (US 6,628,728) and Kleiner (US 6,847,997).

Helkey et al discloses a modulating apparatus for optical communication which modulates a carrier by a modulation signal and generates a modulated wave, wherein modulation is executed to satisfy (column 6, line 10-26):

fd>f1, (the f_1 of Helkey et al is the fd of applicant, and the lower limit frequency of a use-permitted frequency band can be any number between the "2" and "5" in Figure 8).

fu<f2, (the f_2 of Helkey et al is the fu of applicant, and the upper limit frequency of a use-permitted frequency band can be any number between the "7" and "10" in Figure 8) and

fd>fu/2 (Eq. 5, $f_1>f_2/2$, column 6, line 26, and column 27-39),

Helkey discloses a center frequency $fc = (f_1+f_2)/2$, and then

$f_1 = fc - (f_1+f_2)/2$, and $f_2 = fc + (f_1+f_2)/2$,

by Eq. 5, $f_1>f_2/2$, it can be easily obtained that:

$fc = (f_1+f_2)/2 > 3*(f_2-f_1)/2$,

For a square filter, the symbol rate fsr can be interpreted as (f_2-f_1), we have: fc > 3fsr/2.

when a lower limit frequency of a use-permitted frequency band is f_1 [Hz], an upper limit frequency of the use-permitted frequency band is f_2 [Hz], a carrier frequency is fc [Hz], and a symbol rate of the modulation signal is fsr.

But, Helkey et al discloses a modulated laser and does not discloses that (A) the modulating apparatus generates a modulated wave to be supplied to a **light emitting diode** or a light transmitting unit having the light emitting device which is driven by the modulated wave generated by the modulating apparatus and outputs a light-modulated wave; and (B) $fc>3(1+\alpha)fsr/2$, a rolloff factor is α; and (C) a **computer program product** for making a computer function as a modulating apparatus, by executing the computer program, for optical communication which modulates a carrier by a modulation signal and generates a modulated wave to be supplied to a light emitting device.

With regard to item (A), however, Sakura et al teaches a light transmitting unit, LEDs driven by the modulated wave generated by the modulating apparatus and outputs a light-modulated wave, for optical communication because the LEDs can reduce the module cost ([0009]).

Therefore, it would have been obvious to one of ordinary skill in the art at the time the invention was made to combine the LEDs taught by Sakura et al with system and method of Helkey et al so that the system cost can be reduced and the nonlinear distortion can be removed.

With regard to item (B), the Nyquist filter has been widely used in digital or optical communications, such Nyquist filter has the advantage to eliminate the inter-symbol interference et at and minimize the noise effects, as disclosed by McCarty (BACKGROUND).

While the Nyquist filter is used, the parameter controlling the bandwidth of the raised cosine Nyquist filter is the roll-off factor α. The roll-off factor α is one (α =1) if the ideal low pass filter bandwidth is doubled, that is the stop band goes to zero at twice the bandwidth ($2f_N$) of an ideal brick wall filter at f_N. If α.=0.5 a total bandwidth of $1.5f_N$ would result, and so on (Figure 3a, column 4 line 56-65, and column 5 the equations). The lower the value of the roll-off factor α, the more compact the spectrum becomes but the longer time it takes for the impulse response to decay to zero. The most bandwidth efficient filter is the "brick wall" filter illustrated in Fig. 3a by the box (α=0). FIGS. 3a and 3b illustrate three cases, namely when α=0, α=0.5 and α=1.0. Because of the roll-off factor α, the frequency band for a roll-off factor α can be written as $(1+\alpha)f_N$.

Then for a carrier frequency of fc and a symbol rate fsr (that is $2f_N$ in McCarty), it is inherent that: the upper limit sideband for a roll-off factor α will be: $fu = fc + (1+\alpha)f_{sr}/2$; and the lower limit sideband for a roll-off factor α will be: $fd = fc - (1+\alpha)f_{sr}/2$. Therefore, through the Eq. 5, $f_1>f_2/2$ (or fd>fu/2), disclosed by Helkey, it can be easily obtained that:

$fc > 3(1+\alpha)fsr/2$.

The Nyquist filter or the formula $fc>3(1+\alpha)fsr/2$ is just one of the special cases of the Helkey's Eq. (5): 2*f1 > f2 (or 2*fd>fu). Therefore, it would have been obvious to one of ordinary skill in the art at the time the invention was made to apply the Nyquist filter taught by McCarty to the system of Helkey et al so that the noise effect can be efficiently minimized and nonlinear distortion can be removed.

With regard to item (C), it is well known that the computer or computer programs can be used to control the transmitter parameters so to get the best transmission quality, one example of the computer programs is disclosed by Kleiner. Kleiner uses computer program to control communication links and monitor the link quality (Figure 4 and 5).

Therefore, it would have been obvious to one of ordinary skill in the art at the time the invention was made to implement the frequency condition in the computer program similar to that taught by Kleiner to the system and method of Helkey et al and Sakura et al so that the transmitter carrier frequency and symbol rate can be dynamically determined and the nonlinear distortion can be removed easily.

Conclusion

7. The prior art made of record and not relied upon is considered pertinent to applicant's disclosure.

Nguyen et al (US 6,509,796) discloses a "rule of thumb in choosing intermediate frequencies is to choose the first intermediate frequency at twice the highest input frequency anticipated. This is to reduce the possibility of spurious second order intermodulation distortion" and uses a Nyquist filter to reject the nonlinear effects.

Ackerman (US 6,246,500) discloses a method to minimize the second-order intermodulating distortion.

Aparin et al (US 6,166,599) discloses an impedance matching networks for non-linear circuits.

Dakin et al (US 4,499,502) discloses a conditional equation for carrier frequency and bandwidth.

8. **THIS ACTION IS MADE FINAL.** Applicant is reminded of the extension of time policy as set forth in 37 CFR 1.136(a).

A shortened statutory period for reply to this final action is set to expire THREE MONTHS from the mailing date of this action. In the event a first reply is filed within TWO MONTHS of the mailing date of this final action and the advisory action is not mailed until after the end of the THREE-MONTH shortened statutory period, then the shortened statutory period will expire on the date the advisory action is mailed, and any extension fee pursuant to 37 CFR 1.136(a) will be calculated from the mailing date of

the advisory action. In no event, however, will the statutory period for reply expire later than SIX MONTHS from the mailing date of this final action.

9. Any inquiry concerning this communication or earlier communications from the examiner should be directed to Li Liu whose telephone number is (571)270-1084. The examiner can normally be reached on Mon-Fri, 8:00 am - 5:30 pm, alternating Fri off.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Ken Vanderpuye can be reached on (571)272-3078. The fax phone number for the organization where this application or proceeding is assigned is 571-273-8300.

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see http://pair-direct.uspto.gov. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free). If you would like assistance from a USPTO Customer Service Representative or access to the automated information system, call 800-786-9199 (IN USA OR CANADA) or 571-272-1000.

Li Liu
June 19, 2007

KENNETH VANDERPUYE
SUPERVISORY PATENT EXAMINER